GNMT gene

glycine N-methyltransferase

Normal Function

The *GNMT* gene provides instructions for producing the enzyme glycine N-methyltransferase. This enzyme is involved in a multistep process that breaks down the protein building block (amino acid) methionine. Specifically, glycine N-methyltransferase starts a reaction that converts the compounds glycine and S-adenosylmethionine (also called AdoMet) to N-methylglycine and S-adenosylhomocysteine (also called AdoHcy).

This reaction also helps to control the relative amounts of AdoMet and AdoHcy. The AdoMet to AdoHcy ratio is important in many body processes, including the regulation of other genes by the addition of methyl groups, consisting of one carbon atom and three hydrogen atoms (methylation). Methylation is important in many cellular functions. These include determining whether the instructions in a particular segment of DNA are carried out, regulating reactions involving proteins and lipids, and controlling the processing of chemicals that relay signals in the nervous system (neurotransmitters).

The glycine N-methyltransferase enzyme is also involved in processing toxic compounds in the liver.

Health Conditions Related to Genetic Changes

hypermethioninemia

Three mutations in the *GNMT* gene have been described in individuals with hypermethioninemia. In an Italian family, one mutation substitutes the amino acid proline for the amino acid leucine at protein position 49 (written as Leu49Pro or L49P) and another mutation substitutes the amino acid asparagine for the amino acid histidine at position 176 (written as His176Asn or H176N). In a Greek patient of Roma origin, a mutation was identified that substitutes the amino acid serine for the amino acid asparagine at position 140 (written as Asn140Ser or N140S). The reduced glycine N-methyltransferase activity resulting from these mutations causes hypermethioninemia in affected individuals.

prostate cancer

cancers

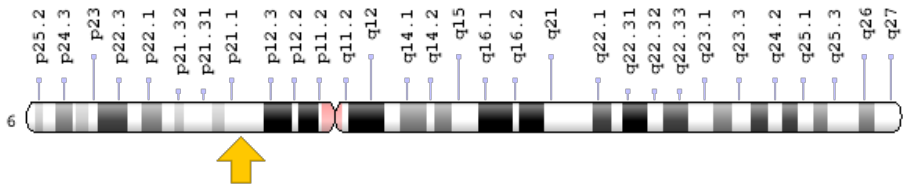
Certain inherited variations in the *GNMT* gene have been associated with an increased risk of liver and prostate cancers. Other *GNMT* gene mutations that have been found in cancerous tumors are acquired during a person's lifetime and are

present only in certain cells. These changes, which are called somatic mutations, are not inherited. *GNMT* gene mutations likely impair glycine N-methyltransferase functions such as processing potential cancer-causing substances in the liver and helping to regulate other genes, including those responsible for controlling cell growth. When cells grow too rapidly or in an uncontrolled way, a cancerous tumor can form.

Chromosomal Location

Cytogenetic Location: 6p21.1, which is the short (p) arm of chromosome 6 at position 21.1

Molecular Location: base pairs 42,960,754 to 42,963,880 on chromosome 6 (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- Glycine Methyltransferase
- Glycine Sarcosine Methyltransferase
- Glycine Sarcosine N-Methyltransferase
- GNMT_HUMAN

Additional Information & Resources

Educational Resources

- Biochemistry (fifth edition, 2002): Methionine Metabolism https://www.ncbi.nlm.nih.gov/books/NBK22453/?rendertype=figure&id=A3252

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28GNMT%5BTIAB%5D%29+OR+%28glycine+N-methyltransferase%5BTIAB%5D%29%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D

OMIM

- GLYCINE N-METHYLTRANSFERASE
  http://omim.org/entry/606628

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/GC_GNMT.html
- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=GNMT%5Bgene%5D
- HGNC Gene Family: Seven-beta-strand methyltransferase motif containing
  http://www.genenames.org/cgi-bin/genefamilies/set/1400
- HGNC Gene Symbol Report
  http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=4415
- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/27232
- UniProt
  http://www.uniprot.org/uniprot/Q14749

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